

# DESIGN OF ROUNDABOUT USING SIDRA INTERSECTION SOFTWARE CASE STUDY: JAWAHARCHOK INTERSECTION, AHMEDABAD

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**Abstract:** This research paper presents data collection and traffic analysis of Jawahar chowk intersection, Ahmedabad, India. Inventory surveys including road inventory and traffic volume studies like classified volume count survey and spot speed study surveys were conducted and data was collected. Data analysis yield that road is overloaded and traffic jams are because of poor management. On the basis of results and location of road, various suggestions and recommendations were hence put for resolving traffic problems. And also design a roundabout using a SIDRA INTERSECTION software .

**Index Terms-** Traffic, Intersection, Analysis, Volume, Capacity, Delay, Accidents, Design.

## I. INTRODUCTION

### 1.1 General

Currently the traffic on the road rises constantly and traffic volume overdoes normal limit. Study of several features of highway traffic is required for preparation, design and maneuver of roadway facilities. For the improved vehicular road traffic it needs better roadway structure with greater capacity. So it needs to analyze capacity for urban roads in heterogeneous condition. For the capacity estimation it is relatively tough to estimate traffic volume on the road. The problem of traffic flow measuring by using Dynamic PCU values.

Traffic behavior in developing countries is largely differ from those or developed countries. Traffic composition of each type of vehicles is slightly different with different static and dynamic characteristics called a fast moving vehicles and slow moving vehicles. Exclusive lanes especially for un-motorized or slow moving vehicles are very uncommon. Impact from large different in speed could be serious problem. Impact from large different in speed could be serious problem in traffic operation, safety and capacity.

## II. LITERATURE REVIEW

**2.1 Pratik U. Mankar et. al. April 2016** in this paper The Capacity of urban roads is find out by green shield model and the results are compared with Microscopic simulation model. The sudden increase in width of lane on the road is checked and result shows that with the increase in road width Capacity of road also increases.

The increasing capacity measured by using micro simulation method and also used a VISSIM software to simulate the data of the capacity of traffic flow. And further the studies of the traffic data, the dynamic PCU values found. The further increase in road width the PCU values for traffic composition are increases as well as capacity of road increases.

**2.2 Zhao Tian. et. al. 2015** Main focus in this paper to found out the urban road traffic weighted network model with considering the functional properties of urban road network and presents the traffic efficiency concept of the road section in the urban road traffic network.

This paper redefines the urban road traffic weighted network model with considering the functional properties of urban road network and shows the traffic efficiency concept of the road section in the urban road traffic network. Then the structural characteristics analysis of the urban road traffic network is provided based on the following three models, the length weighted network model, the traffic capacity weighted network model and the traffic efficiency weighted network model. Then they take the urban road traffic network of study area as an example to analyze the structural characteristics of the road traffic network...

**2.3 Ramesh Surisetty et. al. 2014** in this study found out the capacity of un signalized intersection was calculated from Conflict technique. These Surveys were conducted in Visakhapatnam, to measure different traffic parameters Volume, Flow and

Capacity. In this study movement capacities of that area were evaluated by using HCM (2000) for comparison with approach wise capacities obtained from conflict technique from different directions.

This research found that maximum mixed traffic condition found on a peak hour which is 9 to 11 AM at morning and 6 to 8 PM at evening. And also critical gap and time delay is higher than the capacity of HCM (2000).and also a pedestrian movements have not a safest way.

**2.4 Rajko Horvat** According to the studies the contemporary traffic development has raised the complexity of interaction between traffic branches and intensified the interdependence within the road traffic subsystem, and also their interaction with the surrounding systems.

The methodology is suitable for researching traffic parameters of traffic flows in urban areas. At comparatively low cost it gives results that significantly contribute to designing optimal elements of road infrastructure. Further research should be suggested that including more road types within different environments and cross-sections in order to gain more detailed relationship between specific conditions in which traffic flow operates and consequential relationship between basic traffic flow characteristics

### III. STUDY AREA

#### 3.1 Briefing of the Location

The Maninagar area is a CBD area of Ahmedabad city. Ahmedabad is the primary stations of rail transport for the city of Ahmedabad in the state of Gujarat. And an important center of the western railways zone of the Indian railways. Almost people of Ahmedabad refer to Maninagar railway station. The famous tourist place of Ahmedabad, Kankaria Lake also connected with this route.



Figure 3.1 Jawahar Chowk intersection, Maninagar, Ahmedabad

The road inventory details of the location is given below in the tabular forms.

Table 3.1 Road Inventory Primary Data

Name of Location	Land use				Terrain Condition	Drainage Condition
	North	South	East	West		
Jawahar chowk intersection	L.G. HOSPITAL ROAD	ISANPUR ROAD	MANINAGAR ROAD	BHAIRAVNATH ROAD	Plain Terrain	Covered Drain

The road inventory details of the location is given below briefly with side elements.

Table 3.2 Road Inventory Secondary Data

		carriageway	Median		BRTS Corridor
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Intersecting roads	Number of lanes	Type	Width(m)	condition	(m)	Side walk (m)	Type	Width(m)	Condition
Maninagar road	1	BT- Bitumen	7.1	Good	0.8	0.8	BT- Bitumen	3.0	Good
	2		7.0			0.8		Nil	
Bhairavnath road	1		7.2		0.8	0.7		3.0	
	2		7.1			0.7		Nil	
L.G.Hospital road	1		7.0		0.8	0.8		Nil	
	2		7.0						
Isanpur road	1	7.4	0.8	0.7	Nil				
	2	7.1		0.7					

#### IV. DESIGN OF ROUNDABOUT USING SIDRA INTERSECTION SOFTWARE

##### 4.1 INTRODUCTION OF SIDRA INTERSECTION SOFTWARE

The SIDRA INTERSECTION software is for use as an aid for design and evaluation of individual intersections and networks of intersection. It can be used to analyses signalized intersection, signalized and Unsignalized pedestrian crossings, roundabouts, and roundabouts with metering signals, fully signalized roundabout, two-way stop sign and give way / yield sign control, all-way stop sign control, single point interchanges, freeway diamond interchanges. It can also be used for uninterrupted traffic flow conditions and merge analysis. SIDRA INTERSECTION allows modelling of separate Movement Classes with different vehicle characteristics. These movements can be allocated to different lanes, lane segments and signal phases, for example for modelling bus priority lanes at signals.

##### 4.2 DESIGN PROCEDURE

As per IRC – 65 the value of speed for rotary intersection in urban area is **30 kmph**. So the same design standard had been adopted for rotary design. The design period for rotary assumed to be 10 years. Growth rate assumed to be 2% per year.

For design speed of 30 kmph the value of radius at entry curve suggested by IRC is 15 – 25 m. But as per site condition the value of entry curve at radius has been restricted to 10 m. The value of exit curve should be 1.5 to 2 times the radius at entry curve. The value of exit curve is taken as 15 m.

Table 4.1 Traffic Volume in PCU/hr at Jawahar Chowk Intersection

Vehicle Type	From Isanpur side			From Bhairavnath side			From Maninagar side			From LG Hospital side			Total
	L	S	R	L	S	R	L	S	R	L	S	R	
Bus	-	25	-	14	101	8	28	34	25	-	39	-	274
Car	44	99	273	31	79	87	37	93	218	53	104	149	1267
3-W	10	65	72	24	78	86	39	71	98	41	59	67	710
2-W	29	53	87	36	92	104	27	83	119	39	97	73	839

Cycles	3	27	12	13	17	11	11	19	14	8	17	11	163
Pedestrian	18	48	8	23	12	10	12	6	9	10	22	11	189
<b>Total</b>			<b>444</b>			<b>296</b>			<b>474</b>			<b>300</b>	<b>3253</b>

Theoretically the radius of Central Island is equal to radius of entry curve. But in practical purpose designers adopts 1.33 times the value of entry curve radius. Here radius of **Central Island is 12 m radius** is chosen for radius of Central Island.

Normally for speed 30 kmph the minimum value of weaving length is 30 m. here I have considered **weaving length is 35 m** for all sides as weaving length. Width of carriage way at entry is denoted by  $e_1$ . As per site condition and road geometry it was kept uniform **carriage way as 7 m** for all legs. Width of non-weaving section should be less than width of weaving section. For present study width of **non-weaving section is 12 m**. It is denoted by  $e_2$ .

Width of weaving section should be between 6 – 18 m as per IRC and should generally be more than width of non-weaving section. As per site condition, **width of weaving section is 12.5 m**. It is denoted by  $w$ .

The values of entry and exit angle for all the weaving sections are found to be between  $40^\circ$  to  $49^\circ$ . The internal angles to weaving section are found to be between  $86^\circ$  to  $94^\circ$ . As the entry angles greater than  $30^\circ$  and exit angles less than  $60^\circ$ , internal angles less than  $95^\circ$  all are within IRC recommendation limit. No deduction in the capacity value required.

Table 4.2 Geometry Details of Roundabout at Jawahar Chowk Intersection, Maninagar, Ahmedabad

Road	Radius at		Width of carriage way at		Width of non-weaving section ( $e_2$ )	Average entry width $e = \frac{e_1 + e_2}{2}$	Weaving section			Ratio	
	Entry	Exit	Entry ( $e_1$ )	Exit			Name	Width (m)	Length (m)	$\frac{e}{w}$	$\frac{w}{L}$
A	10	15	7m	7m	12 m	9.5 m	AB	12.5	46.1	0.76	0.27
B	10	15	7m	7m	12 m	9.5 m	BC	12.5	46.8	0.76	0.27
C	10	15	7m	7m	12 m	9.5 m	CD	12.5	43.6	0.76	0.28
D	10	15	7m	7m	12 m	9.5 m	DA	12.5	51.6	0.76	0.24

As per IRC the ratio of  $e/w$  should be between 0.4 to 1 and the ratio of  $w/L$  should be between 0.1 to 0.4. Both the parameters are satisfying.

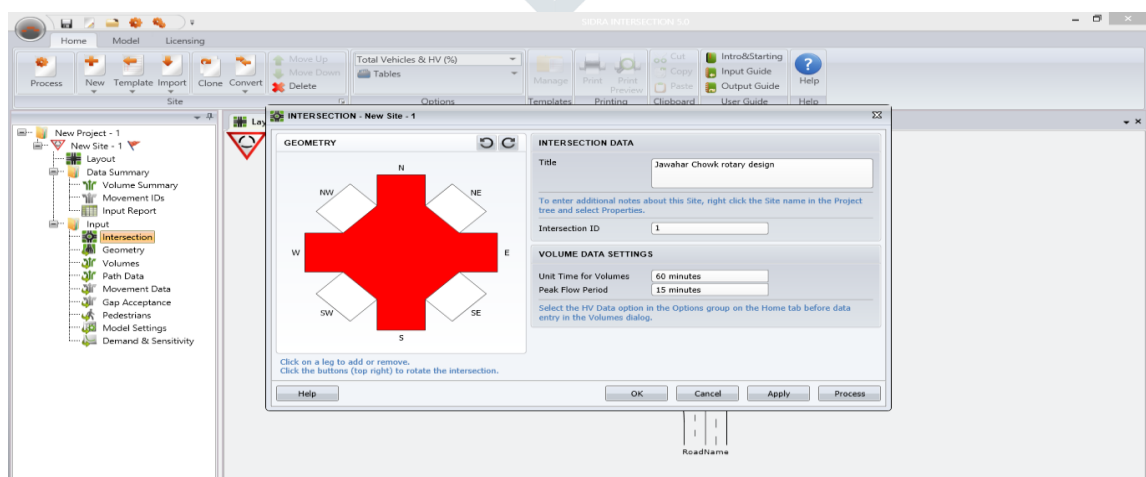


Figure 4.1 Geometry Road Location of Study Area

Input all PCU values of separate lanes and also input lane movements as per site conditions.

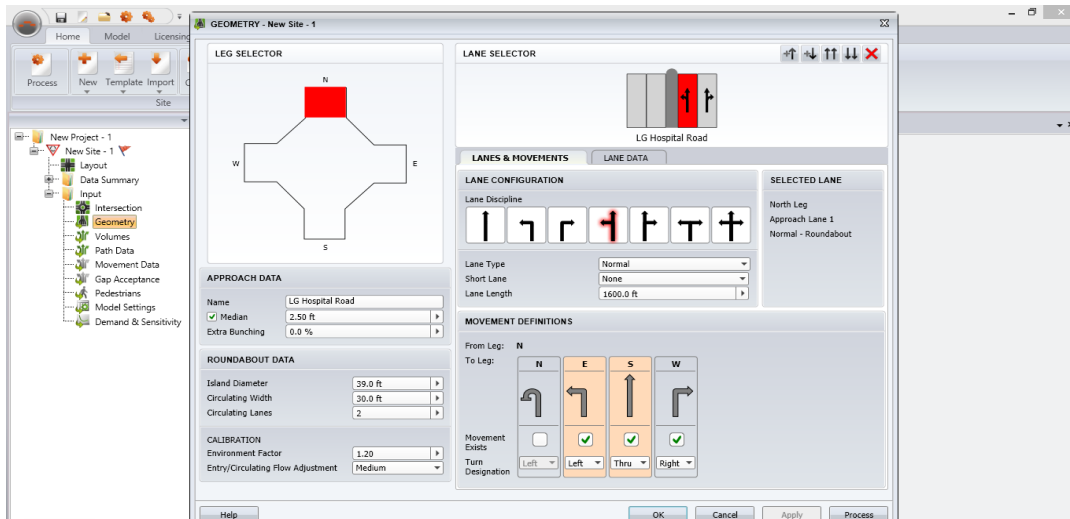
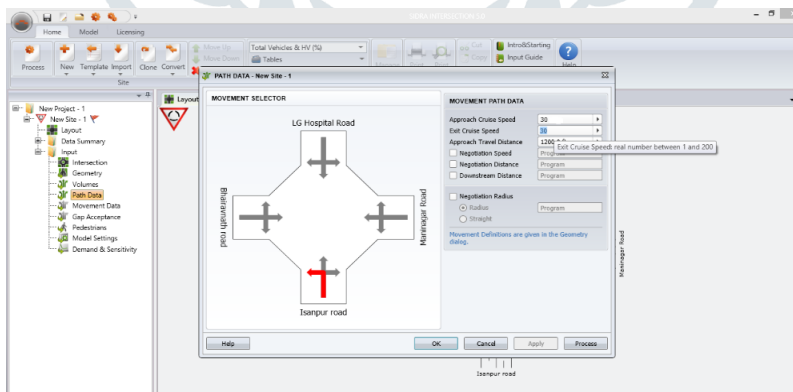
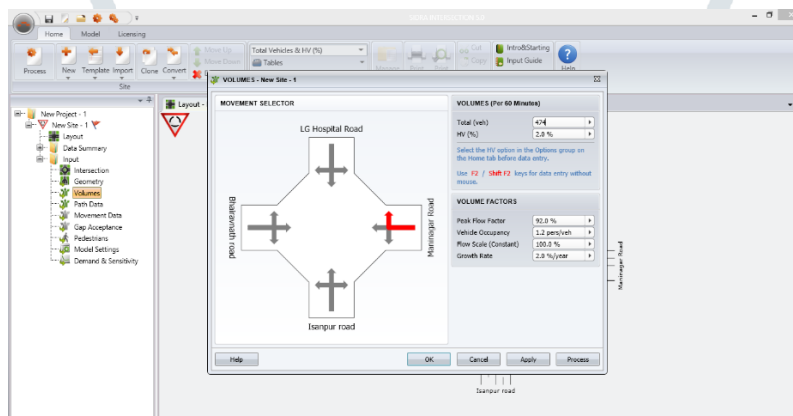


Figure 4.2 Lane Data and Lane Movements of Each Lanes

The movement of the vehicle in each lane is different . So different lane changing movement are consider.



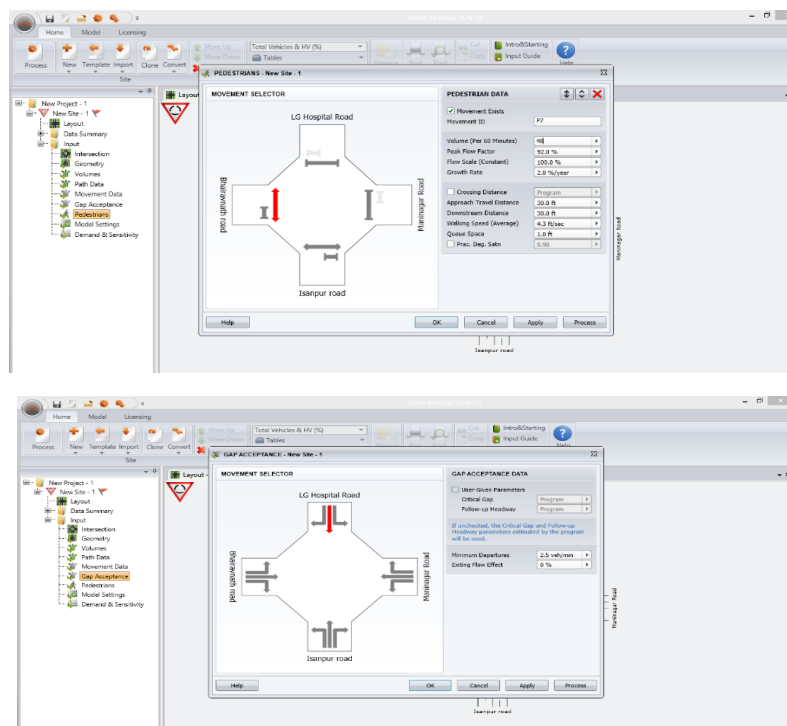


Figure 4.3 Movement Selector of Different Sides

## V. CONCLUSION

The Rapid urbanization is a serious issue faced by most of the metropolitan cities in India. Many people are migrating from rural to urban areas and this urbanization results in the increase a vehicle capacity on the road. So the vehicular growth follows an exponential trend, the infrastructure expansion does not commensurate at the same level, thus results in traffic congestion on city roads. Less usage of public transport also a one side of congestion situation. Hence in the present study, analysis of traffic capacity at the Jawahar Chowk Intersection, Maninagar, Ahmedabad, India. Traffic volumes coming from different approach roads were collected using video graphic techniques and analysed for peak hour traffic volume. And also found out the Spot Speed Study data using Radar Gun Method. Hence the results would be found out that intersection was not design by IRC guideline. So, time delaying and accident problems are facing out. Using these data, as per the suggestion the design of the rotary following IRC guidelines was attempted .And also design a roundabout using SIDRA INTERSECTION software.

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### IRC CODE

- [1] Guidelines for recommended practice for traffic rotaries IRC 65:1976

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